



Solar Water Heating Supply Chain Market Analysis Executive Summary

Navigant Consulting, Inc. (Navigant) reviewed the Solar Water Heating (SWH) market for the City of Milwaukee as part of the Solar America Cities Program. In the *Solar Water Heating Supply Chain Market Analysis* report, Navigant investigated opportunities for SWH manufacturing in the Milwaukee area in three stages:

1. Provide a comprehensive overview of the SWH industry that included the U.S. and global markets, system pricing and economics, various SWH system architectures, system components, and an outline of the SWH supply-chain.
2. Present an opportunity analysis for SWH manufacturing in the Milwaukee area, identified potential opportunities, and made recommendations for local manufactures.
3. Showcase efforts of *Res Manufacturing*, a local manufacturer that was looking to enter the SWH industry, to illustrate key takeaways of value to other manufacturers looking to enter the SWH market.

Overview of SWH Industry

As background, SWH systems use solar energy that is absorbed by a thermal collector to heat water. SWH systems are available in many configurations and are used in multiple applications to provide water heating solutions to residential, commercial, and industrial customers. Three key benefits from SWH include: 1. reduced traditional energy consumption, 2. reduced emissions, and 3. life-cycle cost savings. Most SWH systems in the U.S. today are used for residential and pool applications and are typically installed by local installers. However, larger commercial and industrial systems are a growing segment of the market.

U.S. SWH Industry. During the past 30-plus years, the U.S. SHW market has been highly susceptible to growth and contraction periods, which have correlated with the introduction and retraction of incentive programs. The SWH market is currently experiencing a growth period due to attractive federal and state incentives. While the pool segment of the market is

continuing to grow modestly due to the slowing in the housing market, the domestic hot water segment is growing much faster, at around 30 percent annually.

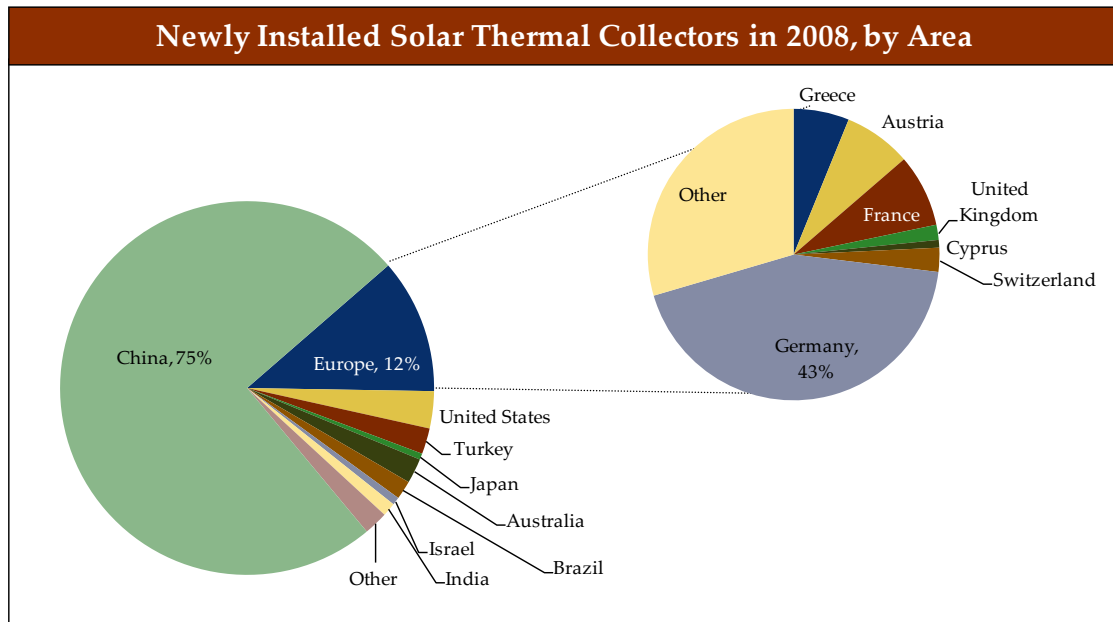
Heating and hot water applications represent up to 70 percent of the U.S. market value, but only 16 percent of the area of collectors shipped in the U.S. Even with strong growth, the total current value of the U.S. SWH market remains modest. In 2010, the U.S. market value was around \$800 million, for which six states account for almost 70% of all domestic SWH systems. The U.S. market is not expected to exceed \$2-4 billion by 2017. In addition, the U.S. is dominated by a few key states and is highly dependent on incentives, making it vulnerable to policy changes. HI, for example, was the largest market in 2009, but recent policy changes are likely to negatively impact its market growth. Growing the U.S. market will require: continued long term support of SWH incentives and other policy support, public education campaigns, and performance based incentives.

Global SWH Industry. The global SWH market is concentrated in China and Europe, with China having the largest volume of systems and Europe with highest value, Figure 1. Some of the most successful national and regional markets exhibit several drivers that have supported rapid growth. These key drivers include:

- long-term incentive programs,
- regulation/mandates for SWH systems in building codes,
- customer awareness through marketing campaigns, and
- areas with limited infrastructure and access to electricity and/or natural gas.

However, there are barriers that continue to inhibit strong U.S. SWH market growth. Key barriers include:

- lack of public awareness,
- lack of qualified installers,
- water heater replacement typically only occurs when an existing water heater breaks. Otherwise, it is an unexpected expense that building owners are not expecting, and typically opt for the regular water heater with a lower up-front cost, and
- long SWH payback periods.



Source: International Energy Agency Solar Heating and Cooling Programme, *Solar Heat Worldwide – Market and Contributions to the Energy Supply 2008, Edition 2010*. May, 2010.


Figure 1. 2008 SWH Market

Opportunity Analysis

The Milwaukee area SWH opportunity analysis demonstrated that, based on Milwaukee-specific advantages and its current industrial base, Milwaukee can provide a good location for manufacturing of components for the SWH industry by leveraging a solid foundation in related industries. Some of Milwaukee's strengths include:

- a strong manufacturing base,
- solid transportation infrastructure,
- strong state incentives for manufacturing and solar installations,
- local interest in entering the solar industry, and
- opportunities to attract existing or new manufacturing to expand or relocate to Milwaukee.

Based on the Milwaukee area's manufacturing capabilities, interest and the value-add ranking of the components, the seven components shown in Figure 2 are worth considering for investment for Milwaukee manufacturers: Assembly Pump Station; Collector Mounting/Racking Systems; Solar Thermal Collector Frame; Expansion Tank; Heat Exchanger for Potable Water; Drain Back Tank; and the SHW Water Storage Tank.

SWH Component	Capability	Interest	Value-Add		SWH Components
SWH Water Storage Tank	Medium	High	Medium		Assembly – Pump Station
Heat Exchanger for Potable Water	High	High	Medium		Collector Mounting/Racking System
Electronic Controls	Low	Low	High		Solar Thermal Collector Frame
Fractional Horsepower Pumps	Low	Low	Low		Expansion Tank
Pump Motor Flanges	Medium	Low	Low		Heat Exchanger for Potable Water
Hydronic Valves	Low	Low	Low		Drain back Tank
Expansion Tank	High	Medium	Medium		SWH Water Storage Tank
Air Elimination Valve	Medium	Medium	Low		
Piping	Medium	Low	Low		
Pipe Fittings	Medium	Low	Low		
Assembly – Pump Station	Medium	Medium	High		
Temperature Gauges	Low	Low	Low		
Pressure Gauges	Medium	Low	Low		
Drain back Tank	Medium	High	Medium		
Pipe Insulation	Low	Low	Low		
Dirt and Air Separators	Medium	Low	Low		
Thermal Mixing Valves	Medium	Low	Low		
Solar Thermal Collector	Medium	High	Medium		
Solar Thermal Collector Frame	High	High	High		
Collector Mounting/Racking System	High	High	High		

The recommendations above are for the entire manufacturing base.
Specific company recommendations will vary depending on interests and capabilities.

Figure 2. Milwaukee Capabilities

Navigant believes that the size and highly fragmented nature of this emerging market presents potential opportunities for new players, but also risks. Milwaukee manufacturers have capabilities to manufacture high-quality components for the SWH industry. These high-quality, high-value components are mostly imported from Europe today, and as a result, customers pay a premium for these components. Locally manufactured components could realize cost savings over imported ones. Local manufacturers could potentially capture about 2–5% of the total U.S. market share (\$10–20 million) in the short term. However, with increased market adoption and industry recognition, local manufacturers could potentially gain higher market shares of 5–10% in the medium- to long-term.

Showcase of Res Manufacturing

The Navigant team conducted a case study on *Res Manufacturing*, a local manufacturer that has successfully retooled for another industry in the past, and is now considering retooling for the SWH industry. This case study identified important criteria that manufacturers should consider when evaluating a new market, including the need to systematically evaluate the market, accurately project the payback requirements, understand the risk of obtaining these payback targets, and target investment in differentiated, value-added products. To succeed in a new market, it is essential to establish a product that has a sustained competitive advantage.

Conclusion

Overall, Navigant addressed the key question, “Should Milwaukee manufacturers retool their factories to enter the SWH industry?” given the overview of the market, the case study example, and the opportunity analysis. The overall response to our analyses is shown in Figure 3. The SWH industry is growing and the market seems to be able to support Milwaukee retooling requirements. To be successful in the SWH market, Navigant recommends targeting multiple customers. The SWH industry is fragmented with smaller customers that could quickly exit and leave manufacturers with stranded assets. Local manufacturers have the capabilities and resources to enter the SWH market, but will likely need to focus on specific components to achieve acceptable market shares.

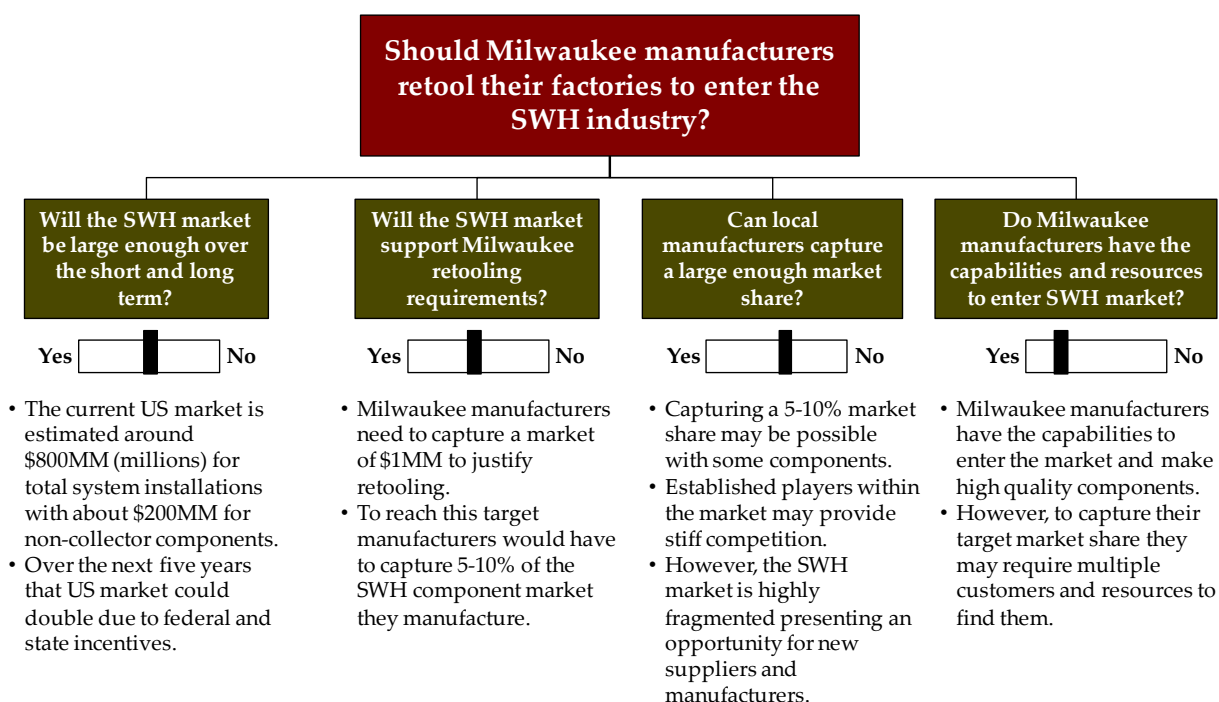


Figure 3. Summary Questions Addressed in SWH Report